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Ag nanoparticles produced by DC magnetron sputtering applied to optical biosensor

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Ag nanoparticles (Nps) are attracting huge interest owing to their unique optical properties combined with high chemical stability and biocompatibility. Ag Nps are among the most studied nanomaterials and have led to the development on innumerous techniques and methods for molecular diagnostics, imaging, drug delivery and therapeutics. Incident light interacting with Ag Nps with smaller sizes than the wavelength of the incident light induces localized surface plasmon resonance (LSPR) used for the construction of sensitive biosensors.There are numerous techniques to synthesize Ag Nps, but the most popular ones are chemical methods including chemical reduction, photochemical reduction, co-precipitation, thermal decomposition or hydrolysis. All these technique are wet techniques including chemical reactions where the control over the size of the nanoparticles and the up-scale of the process present serous issues. In this work, we present the manufacturing of Ag nanoparticles from a plasma gas condensation process based on magnetron sputtering. This technique is a one-step Nps manufacturing process that allows the accurate control of the composition, size, shape and density through the control of the deposition process parameters. It is an optimum technique to manufacture Nps at industrial scale. A deep study of the influence of the process parameters, such as pressure, Ar/He ratio and intensity on the shape, size and particles density, has been carried out to be able to accurately control the manufacturing process.The Ag manufactured Nps will be used as as a robust tool for bio-sensing based on localized surface plasmon resonance (LSPR). They can be used both as a LSPR sensor of silver nanoparticles very sensitive to the immediate surroundings of the nanoparticle surface, and as a method to amplify the wavelength shift observed from a LSPR sensor consisting of a nanostructured silver thin film.

Keywords
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